



**BIRD**  
**INSTRUCTION**  
**book**

FOR

MODELS 3170/71/72/73

WATTCHER®

**Instruction Manual  
for  
MODEL 3170/71 THRULINE®  
HIGH-SPEED WATTCHER®**

**Bird Electronic Corp.  
30303 Aurora Rd.  
Cleveland (Solon), Ohio 44139**

Model 3170/71 THRULINE<sup>R</sup> High-Speed WATTCHER

SUMMARY  
SPECIFICATIONS

	Model 3170	Model 3171
Power Range	100mW to 10kW	250 Watts to 250kW
	Full Scale	Full Scale
Over-range (Alarms)	Beyond 200% of Scale	
Meter Accuracy	±5% of Full Scale	
Alarm Accuracy	±5% " " "	
Impedance	50 ohms	
Response Time	25 $\mu$ sec max	
Activate Forward Monitor Adjustable Delay	73 $\mu$ sec to 50 msec, nom.	
All Inputs and Outputs	Will interface Directly to TTL	
Output Drive Capability	Will sink 180 mA	
5V Supply Output	Will source 360 mA; regulated	
Insertion SWR	1.05 max, DC to 1 GHz	
AC Power	115/230 VAC - 50/60 Hz - 10 watts max	
Dimensions	19" x 5-7/32" x 11-3/4" (483 x 133 x 298 mm)	
Weight	7 lbs (3.2 kg)	4 lbs. (1.8 kg)

\*Frequency & Power Range determined by plug in element selected.

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Introduction

The 3170/71 is a monitoring system made up of a two-channel power meter with outputs for additional remote meters, and an alarm system with user adjustable set points. The device monitors reflected power continuously: If the RFL power level exceeds the users set point, the alarm is sounded and an LED is lit showing the cause of the alarm. Both the alarm and the LED stay energized until the system is reset, either via the front panel switch or the remote reset input on the rear panel. The forward power monitoring circuit is activated and deactivated via a rear panel input. If forward power drops below the user setpoint while the forward monitor is active, the alarm will sound and the "FWD Trip" LED will light. Both the alarm and the LED will stay energized until the device is reset. There are four auxiliary alarm inputs on the rear panel which may be wired to other equipment as desired. These inputs will sound the alarm but will not light any LEDs.

Furthermore, the device has two rear panel outputs - each capable of driving a pilot light or relay directly. One is energized whenever the alarm is sounding, the other is activated when the forward power exceeds a separate user setpoint. This can be used to confirm that power is present or as a second setpoint for some other purpose.

Safety Precautions

Never remove the top of the device while AC power is applied.

Do not reach inside the unit with long conductive tools, etc., when the front panel is removed for calibration.

Avoid overloading the outputs - damage may result to the instrument (see table).

Safety Precautions (Continued)

Be sure 115/230 switch on rear panel is set to the proper line voltage before applying AC power.

Be certain that the instrument is properly grounded.

Theory of Operation

Direct current signals representing operating power levels are brought into the 3170/71 from the sensing elements thru the rear panel jacks J1 and J2. These currents are shunted to ground through 1400 ohm resistors. The voltage developed across these resistors is amplified by a pair of operational amplifiers to approximately 1 volt (meter full scale). The drive current to the main indicating meters is taken from the amplifier outputs through series resistors of 33.2 K each. The drive voltage for remote meters also comes from the amplifier outputs and is buffered by a pair of op-amps configured for unity gain. This protects the 3170/71 circuitry against accidental shorting of the remote meter line.

The calibrate/operate switch and the two reference potentiometers (See figure) allow the user to substitute an adjustable current in place of the signals from the sensing elements to facilitate adjustment of the set-points.

The three set-point potentiometers (Forward, Reflected, and Confirm) provide DC voltages which are compared to the amplifier outputs by three comparators. The LED to the left of each pot indicates whether the incoming signal is higher (LED on) or lower (LED off) than the set-point of the pot.

The output of the confirm comparator goes directly to the

Theory of Operation (Continued)

confirm output drive transistors. The output of the reflected comparator goes directly to the alarm circuitry and to the "reflector monitor tripped" LED latch. The output of the forward comparator is gated by the "activate forward monitor" signal (AFM) before going to the alarm circuitry and LED latch. In other words, the signal is blocked if the "activate forward monitor" signal is not present. The AFM signal passes through a delay circuit before reaching the gate. This delay is adjustable from 71 microseconds to 50 milliseconds. The purpose of the delay is to allow for any delays in the users equipment between the outputting of the "carrier on" signal and the appearance of power on the transmission line.

The reset signal clears the horn latch and the two "trip" LED latches. This signal can come from three sources: The push-button switch on the front panel, the rear panel input/output, or from the "power-up" reset capacitor when the device is first turned on or after a power interruption.

Installation

- 1) Mount unit in rack (ASA Std. Rack Panel Size C)
- 2) 3170: Bring RF to line section  
3171: Install line section  
Bring DC to unit using two cables.
- 3) Attach any remote inputs or outputs required for your installation (See Tables).
- 4) Set calibrate/operate switch to calibrate position.
- 5) Set 115/230 line voltage switch to match the line voltage you will be using and apply power via the line connector on the rear panel.

Installation (Continued)

(6) If the yellow "reflected monitor active" LED does not light, disconnect power and refer to the trouble shooting section of this manual.

(7) Adjust set-points to desired levels as follows:

Using the forward reference pot adjust the forward meter to read the level at which the forward alarm is desired to trip. Adjust the forward set-point potentiometer until the miniature LED to the left of the pot is just at the transition from off to on. Turning the pot clockwise will raise the set-point and turn the light off, turning the pot counterclockwise will do the opposite.

Using the reflected ref pot and the reflected set-point pot, set the reflected trip point in a similar manner.

Note: the alarm will trip during this operation unless the reset button is held in.

The confirm set-point is adjusted using the forward reference pot and the confirm set-point pot. If the confirm output is not used, it is unnecessary to adjust the confirm set-point pot.

Once the set-points are adjusted the calibrate operate switch can be returned to the operate position.

(8) Set the AFM delay to the desired duration using the six-station DIP switch, (See Table). If the AFM input is wired to ground, it is unnecessary to set the delay. However, at least one of the first three stations must be in the ON position for the FWD monitor to function.

There are two ways to determine the required delay: 1) If

Installation (Continued)

the delay in the users equipment is known, the AFM should be set to the same delay plus a minimum of 25% safety factor. 2) The second alternative is to set the AFM to progressively shorter delays until switching on the carrier causes the FWD monitor to trip when the users equipment is known to be working properly. Then add a 25% safety factor to the delay indicated by the switch setting and set the delay to that setting. Note that the disabling of the forward monitor is virtually instantaneous when the AFM signal is removed and is unaffected by the switch settings.

The Model 3170/71 is now ready for service.

Rear Panel Inputs & Outputs

<u>Description</u>	<u>Connection</u>	<u>Function</u>	<u>Levels</u>
DC Input FWD & RFL	BNC jacks J <sub>1</sub> & J <sub>2</sub> (P1-8,19) (P1-10,20)	Detected RF levels from sensors	30uA full scale into 1400 ohms (42 mV). May be over-ranged to 100 mV.
DC main meter drive output	J3 (P1-17,18)	Current to drive indicating meters	30uA full scale into 1400 ohms (42 mV)
DC remote meter drive output	J4 (P1-15,16)	Voltage to drive remote indicating meters	1.038V full scale (use 33.2K resistor in series with std. Bird 30uA meters)
Aux. Alarm Inputs	TB1,2,3,4 (P1-1,2,3,5)	Signals to trip alarm from external sources	TTL levels, active low pulled up to 5V by 4.7K internally. Shunted to ground by 0.1 uF cap
Reset input/output	TB8 (P1-4)	Input to reset 3170 from external source. May be used as an output to reset other equipment when 3170/71 is reset by the front panel switch	TTL levels, active low pulled up to 5V by 4.7K shunted to ground by 10uF cap
Activate FWD monitor input (carrier on)	TB 10 (P1-6)	Indicates to 3170/71 that the RF is on and that FWD power should be monitored for a low condition. There is an adjustable internal delay on the leading edge of this signal	TTL levels active low pulled up to 5V by 4.7K
Alarm Output	TB 6 (P1-9)	Low whenever alarm is sounding. Returned high by reset	TTL levels active low. Open collector pulled-up to 5V by 4.7K. Will sink 180mA

Rear Panel Inputs & Outputs (Continued)

<u>Description</u>	<u>Connection</u>	<u>Function</u>	<u>Levels</u>
Confirm output	TB9 (P1-7)	Low whenever FWD power exceeds the users conf set-point	TTL levels active low. Open collector pulled-up to 5V by 4.7K will sink 180 mA.
5V output	TB5 (P1-11,12)	Regulated 5V output	Can supply 360mA max.
Ground	TB 7 (P1-13,14)	Chassis ground	Reference for other signals

Table 2  
Setting AFM Delay

SW1, 2, 3	SW6	-	ON	OFF	OFF
	SW5	-	OFF	ON	OFF
	SW4	-	OFF	OFF	ON
ON, ON, ON		71	μ sec	710	μ sec
OFF, ON, ON		83	"	830	"
ON, OFF, ON		100	"	1	m sec
OFF, OFF, ON		121	"	1.21	"
ON, ON, OFF		167	"	1.67	"
OFF, ON, OFF		250	"	2.5	"
ON, OFF, OFF		500	"	5.0	"
					50.0

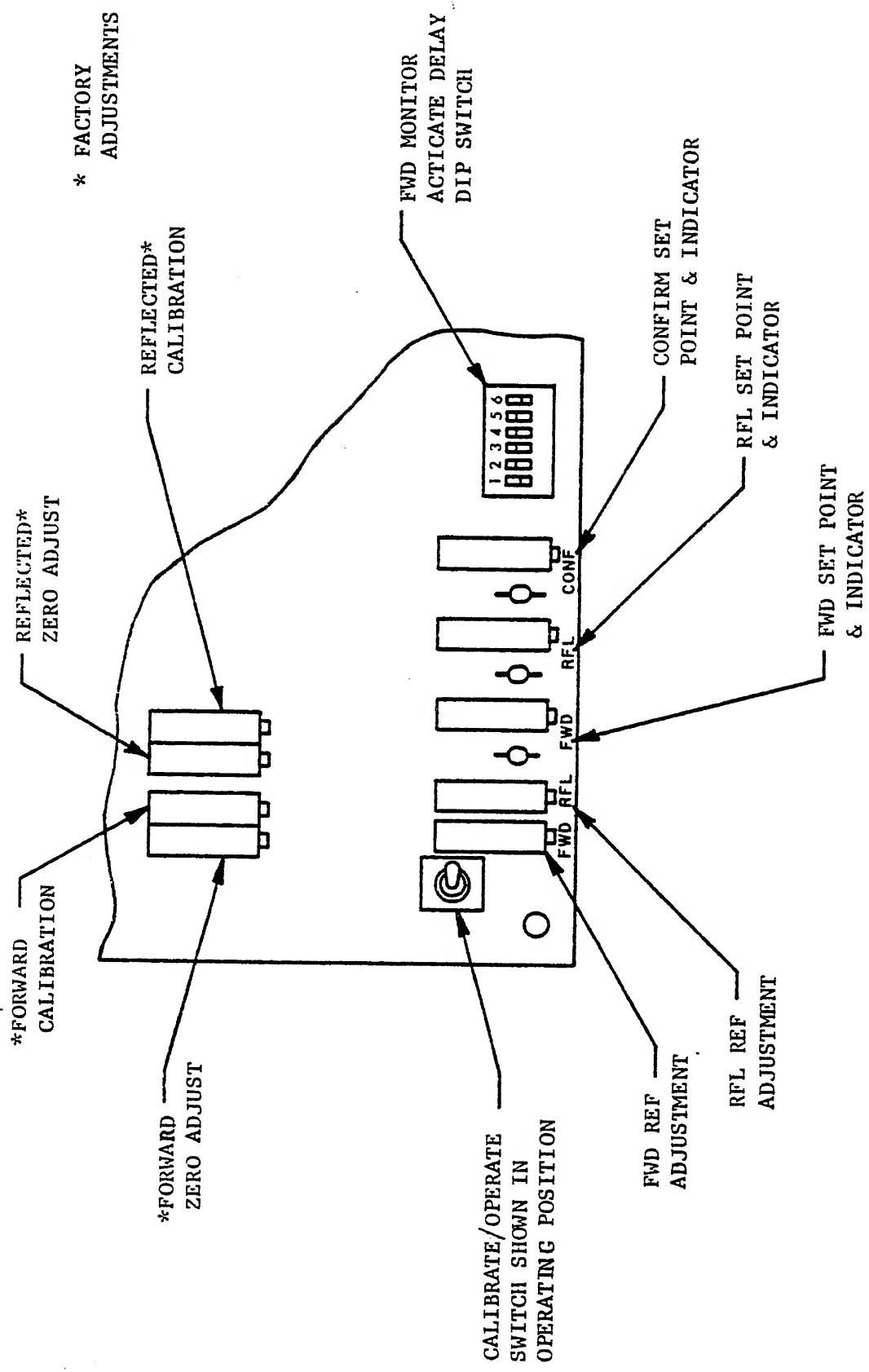
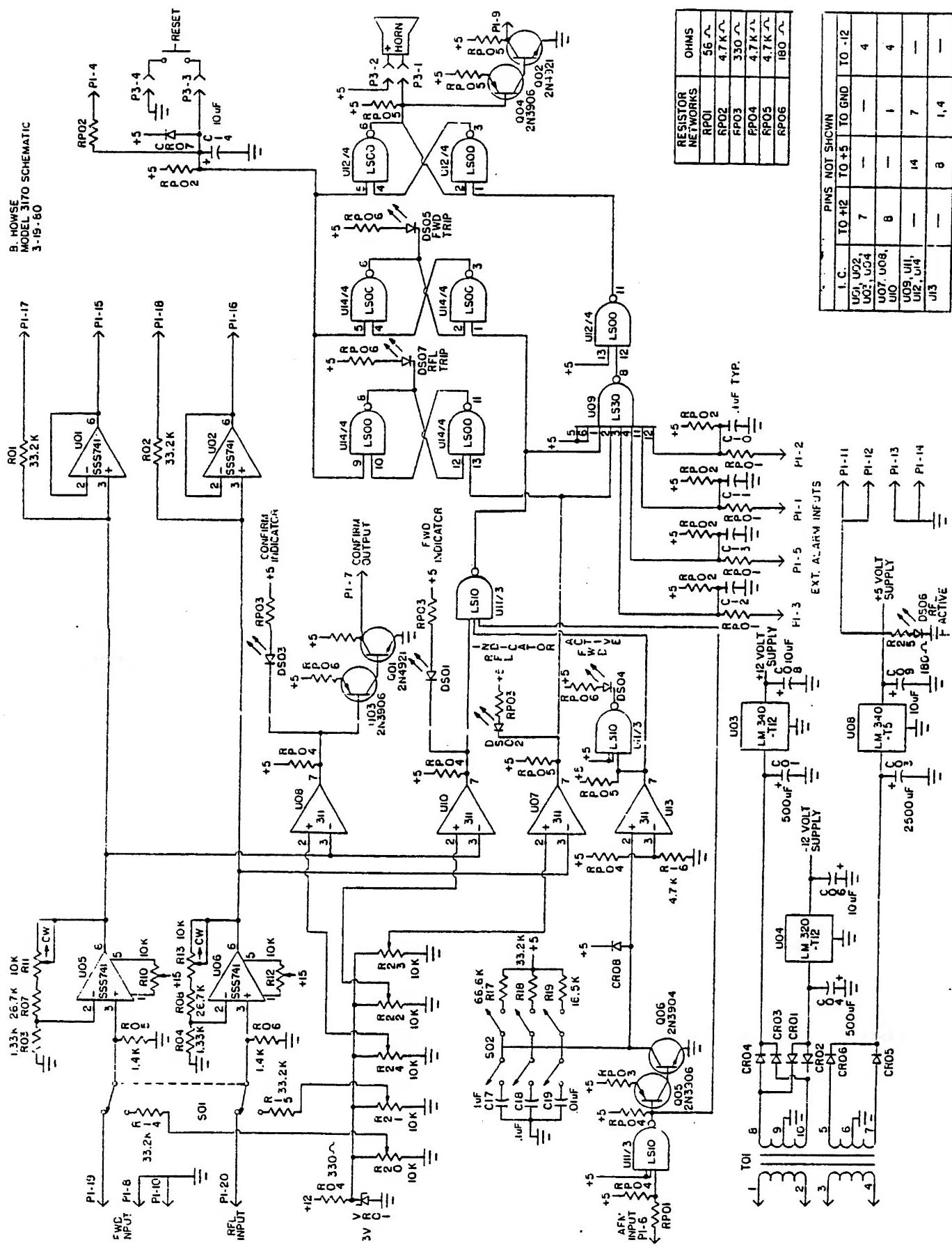
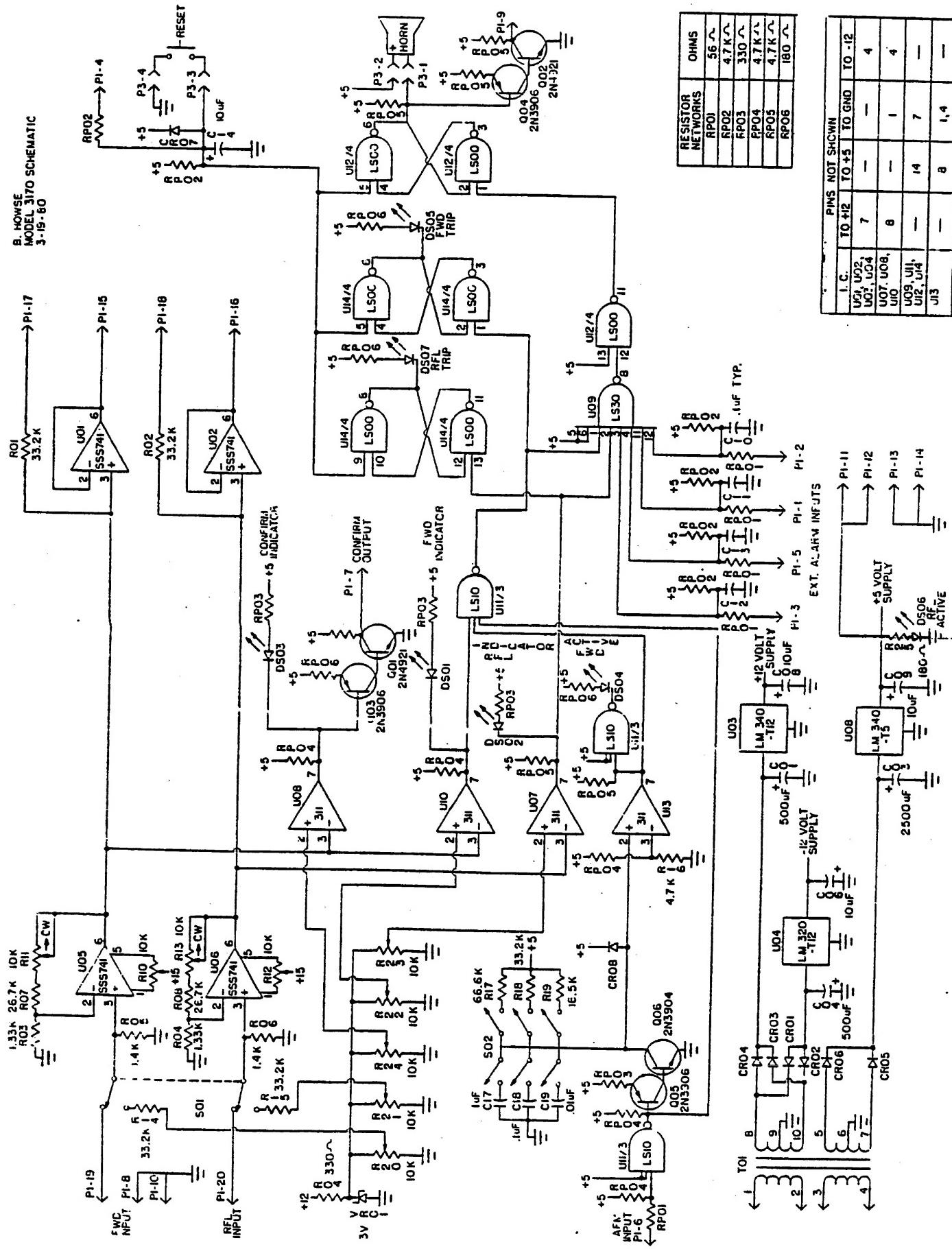


FIGURE 1  
INTERNAL CONTROLS AND ADJUSTMENTS



B. HOWSE  
MODEL 3170 SCHEMATIC  
3-19-60

ROI PI-17



Trouble Shooting

Start at top of symptoms list and trouble shoot first problem on list before proceeding to next.

<u>Symptom</u>	<u>Cause</u>
1) Yellow "RFL monitor active" LED not lit	a) AC power not on. b) Fuse blown c) 5V output overloaded d) Internal 5V supply not working
2) Main panel meters do not indicate	a) Sensing element not correctly seated b) Cabling from line section to instrument not properly connected or damaged c) Cabling to meters open d) Instruments internal + and - 12 volts supply not working
3) Remote meters not reading	a) Short or open in remote meter cabling
4) Remote meters pegged	a) Series resistors of 33.2K or resistor-pot combinations are required for each remote meter
5) Yellow "FWD monitor active" LED lit but FWD monitor does not trip	a) DIP switch setting incorrect
6) Neither red LED lights but alarm will not reset	a) External alarm input shorted to ground
7) No alarm works - red LEDs will not light	a) Reset line shorted to ground

MODEL 3172 WATTCHER

ADDENDUM

FOR USE WITH

MODEL 3170/71 MANUAL

The Model 3172 THRULINE® High Speed Wattcher is equivalent to the Model 3170 and has essentially identical performance specifications. It differs only in the following respects:

1. A line section is not incorporated into the Wattcher panel but rather is to be externally mounted in the coaxial transmission line.
2. The Active Forward Monitor (AFM) Input P1-6 has a diode (1N4148) added in order to respond to higher input voltages. For Model 3172 the active state is -0.5 to 0.2 volts and the off state is +5 to +50 volts.
3. The power cord is supplied according to customer order.
4. The weight of the panel, because of the deleted line section, is reduced to 5.5 lbs. (2.5kg).

MODEL 3173 WATTCHER  
DIFFERENCE DATA SHEET  
FOR USE WITH  
MODEL 3170/71 INSTRUCTION BOOK

The Model 3173 THRULINE® High Speed Wattcher is equivalent to the Model 3170 and has essentially identical performance specifications. It differs only in the following respects:

1. A line section is not incorporated into the Wattcher panel but rather is to be externally mounted in the coaxial transmission line.
2. The power cord is supplied according to customer order.
3. The weight of the panel, because of the deleted line section, is reduced to 5.5 lbs. (2.5kg).